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BRIDGING THE GRADE SIX TO SEVEN GAP WITH CONTINUOUS PROGRESS.

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THIS STUDY REPORTED THE DEVELOPMENT OF MATHEMATICS PROGRAM WHICH INCLUDED STUDENT SELF-STUDY FEATURES. STUDENTS IN GRADES SEVEN AND EIGHT WERE PROVIDED WITH SELF-STUDY MATERIALS. OBSERVATIONS WERE MADE OF STAFF PATTERNS IN LEARNING. PRE- AND POST-TESTS WERE ADMINISTERED TO THE ENTIRE STUDENT POPULATION AND THE RESULTS ANALYZED. ANALYSES WERE ACCOMPLISHED THROUGH MULTIVARIATE TECHNIQUES AND OTHER CHECK METHODS. THERE WERE NO SIGNIFICANT DIFFERENCES IN ACHIEVEMENT MADE BY USE OF THIS NEW INSTRUCTIONAL METHOD. THE PROGRAM DID NOT CHANGE THE STUDENT ATTITUDE TOWARD MATHEMATICS. THE RESULTS ALSO INDICATED THE POSSIBILITY OF FURTHERING RESEARCH ON A COOPERATIVE BASIS BETWEEN SCHOOLS. (RS)

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# BRIDGING THE GRADE SIX TO SEVEN GAP WITH CONTINUOUS PROGRESS

Cooperative Research Project No. S-140

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Weston, Massachusetts

1966

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C O N T E N T S

Problem ..... 1

Objectives ..... 6

Procedures ..... 8

Analyses of Data and Conclusions ..... 10

Related Research ..... 20

Summary of Results ..... 22

Appendix (Tables) ..... 23

## TABLES


TABLE 1 - Medians for Check-Tests Used in Survey

TABLE 2 - The Means and Standard Deviations of Self-Study and Traditional Groups on All Measures

TABLE 3 - The Means and Standard Deviations on all Measures for Pooled Groups - Traditional, Self-Study (Pre-Experimental Year), and Self-Study (Experimental Year)

TABLE 4 - A Comparison of a Classification of INS and OUTS Based on a Discriminate Function and the Observed Classification

TABLE 5 - Hits and Misses Based on a Discriminant Function Between INS and OUTS

TABLE 6 - The Difference Between The Means On Two Administrations of a Mathematics Attitude Test for Traditional and Self-Study Groups

TABLE 7 - The Means and Standard Deviations of the Pooled Traditional Group and Self-Study Groups Divided Into Those Who Stayed In The Self-Study Program (IN) and Those Who Were Removed From The Self-Study Program (OUT) On All Measures

TABLE 8 - The Means and Standard Deviations of Pooled Traditional, Self-Study Pre-Experimental Year, and Self-Study Experimental Year Groups With Self-Study Groups Divided Into Those Who Stayed In The Self-Study Program (IN) and Those Who Were Removed From the Self-Study Program (OUT)On All Measures

PROBLEM

In the fall of 1962 the Weston Junior High School initiated self-instruction as a mode of mathematics learning in its seventh and eighth grades. Physical facilities were constructed called a Mathematics Laboratory which consists of a single large room seating 90 students and is furnished with student study booths for two students each around hexagonal tables. In the center of the room is a four-desk complex seating three teachers and one clerical assistant. Along the wall are single student booths in which check-tests are written. To the sides of this large room are two small rooms called seminar rooms in which small groups of mathematics students gather. Self-study guides are provided with the SMSG mathematics texts. Self-tests and check-tests are written for many sections of the text.

Pupil teams of two students each are assigned on a matched basis. The equivalent of three traditional size classes are scheduled for the Mathematics Laboratory during one period. Five of these sections are scheduled during the day. Three of these sections are seventh grade age group and two are the eighth grade age group. All sections are heterogeneous. Teams of students begin the study of SMSG mathematics and proceed through the text material at their own rate of learning. Teachers in the laboratory are assigned certain students for which they are responsible. Frequently teachers assemble groups of students who have comparable needs and remove them to the seminar room where either remedial instruction is given or discussions

are held on more advanced problems. It is estimated that each student would attend one or two seminars each week. Members of pupil teams who can not resolve a problem or a question as it arises in their study procedure can raise their hands and the teacher in attendance will come to their study carrel to answer questions.

Students are taught to determine whether they are ready to take the check-test by analysis of their self-tests. Self-test corrections are done by the students. When each student is satisfied that he is able to handle the materials of the section just finished, he would be verbally examined by the advisor. The student would then receive from the clerk a copy of the check-test for that section and take the test in one of the testing booths. These tests are then corrected by the clerk-aide and analysis of the check-test by the teacher indicates areas of weakness where students needed special teacher attention. The pupil corrects the errors and returns the test to the teacher for checking and filing.

It was arranged so that students in the sixth grade could enter the Seventh Grade SMSG Program if they had finished the sixth grade materials. The sixth grade materials were studied in a similar manner using self-instruction, pupil-team, open progress organization. Conversely, students who had not finished sixth grade work would be provided with the opportunity to continue in their sixth grade material

until they were confident of mastery in this area.

Although preliminary tests and observations indicated that the students average as well on standardized tests using the self-study technique as in the traditional fashion, and, further, that the students seemed to become more responsibly involved in their own education as indicated by various self-initiated behaviors, there were also many problems which had not yet been solved:

1. It was apparent that the study materials which were initially written for the text, are inadequate for good self-study by the majority of students. More complete materials were needed in order to develop a more adequate mastery of mathematical skills.

2. The check-testing procedure was too cumbersome for the students and tended to hold them back so that their progress was slower than in a traditional classroom.

3. Between 15 and 20 per cent of the students proved to be inadequate for the task of self-instruction with the materials as they were constructed. These students had to be removed to a more traditional atmosphere in order to maintain any semblance of academic progress.

4. The check-testing system was too cumbersome for one clerk-aide to correct and still keep ahead of the necessary work. It became apparent that the check-testing system should be re-written and re-designed. The teachers found that it was impossible to carry on the instructional work of the Mathematics Laboratory and at the same time have adequate opportunity to revise and enlarge the study materials which were needed in great abundance.

5. It was apparent that new materials should be constructed for the more rapidly progressing students so that they would not be continually outrunning the prepared materials.

6. The lack of funds and the inadequate assistance for a developmental project of this nature prevented proper evaluation and observation of the important and interesting events which were taking place in this new environment. It was necessary to know, for instance, what staffing would be adequate to the task we had set out to accomplish, whether the students were not missing some vital educational experience which was provided in the traditional classroom and to what extent the new environment was making a positive effect on behavior.

It was obvious that if the Mathematics Laboratory was to realize its potential as an organizational device to allow students to progress at their own rate of learning and to make a continuum of study across the curriculum gulf which traditionally exists between grades 6 and 7, further assistance was needed in the Mathematics Laboratory and an evaluation of process should be undertaken.

OBJECTIVES

1. To organize a junior high school mathematics program which makes an infinite number of study levels available to the student.

2. To make a mathematics learning program which is independent of grade level.

3. To measure the extent to which students of the junior high school can progress through a mathematics self-study program according to their energy and ability as indicated by the number of students who:
   a. are studying mathematics in grade levels beyond their own;
   b. the number of students who are studying mathematics at grade levels below their present grade without physical separation of the students.

4. To determine whether students, each learning at his own level, will average as high on standardized tests as they average under normal classroom organization in the junior high school.

5. To find out what percentage of the junior high school student population is unable successfully to employ self-study techniques as determined by passing scores on check-tests given after each unit of study.

6. To be able to predict which students are unable to profit from self-study by correlating scores on I.Q., personality tests, and achievement tests with individuals who must be removed from self-study classes because of inadequate performance.

7. To determine what staff and what levels of professionalism are necessary for maintaining the speed and quality of mastery through self-instruction comparable to that gained through traditional instruction.

8. To determine what change in student attitude, if any, toward mathematics is caused by the self-instruction method of learning.

PROCEDURES

1. Methods and techniques were devised to speed up the development of the existing Weston Junior High School Mathematics Laboratory, which was progressing too slowly to take care of the needs of the students due to lack of funds.

2. A full-time research assistant was hired for the purpose of augmenting present study-guide materials and of further developing present techniques of evaluation and check-testing so that self-study materials would be available to all students on many levels.

3. With the exception of two classes, all students in grades 7 and 8 were placed on self-study materials.

4. Series of periodic observations by the Principal and the Director of Research were initiated to determine the adequacy of existing staff patterns in maintaining learning for grades 7 and 8 in mathematics.

5. Standardized tests (STEP and SCAT) were given to the entire student population at the beginning and end of the project period. I.Q. and standardized test results from elementary school were collected and analyzed. The analysis was performed with programs of the Multivariate Statistical Analyser (Jones, 1964).

6. Mathematics attitude tests were given at the beginning and end of the project period. The test was taken from Improving Mathematics Programs (M. Vere De Vault).

7. A pilot study was undertaken with two neighboring communities to help evaluate effectiveness of the check and unit tests.

8. Writing of self-study materials, check-tests and unit tests was continued.

## ANALYSIS OF DATA AND CONCLUSIONS

The format for reporting the findings will be to state the objectives of the study, to indicate how each was met, giving a statistical analysis where appropriate, and to draw conclusions whenever possible.

### Objective 1

To organize a junior high school mathematics program which makes an infinite number of study levels available to the student.

As described in the Problem (page 1 ), this objective was accomplished to the extent that an independent level of study was maintained by each pupil. When progress lagged, a policy of minimum weekly progress was established. When it became obvious that students could not handle the process, they were put into a more traditional environment.

### Objective 2

To make a mathematics learning program which is independent of grade level.

A mathematics learning program independent of grade level was developed. Vertical development in the curriculum was achieved by permitting individual pupils to work as rapidly as possible independent of the class.

Self-study materials were prepared including study guides, rate progress charts, self-tests, check-tests, and unit tests to accompany the SMSG Junior High textbooks. A similar Sixth Grade Program was devised for those pupils who came to the seventh grade not having completed the previous year's work. A Ninth Grade SMSG Algebra Program was offered for the pupils who had completed both the Seventh and the Eighth Grade Programs by the end of the seventh grade.

Objective 3

To measure the extent to which students of the junior high school can progress through a mathematics self-study program according to their energy and ability as indicated by the number of students who:

a. are studying mathematics in grade levels beyond their own;

b. the number of students who are studying mathematics at grade levels below their present grade without physical separation of the students.

Acceleration by 25 per cent of the seventh grade students enabled them to complete the basic program of the seventh and eighth grades by the end of the year. These students began the Ninth Grade Algebra Program in September, 1965.

Early results indicate this program is successful. 12 per cent of the eighth grade students enrolled in an Algebra I course. All completed the course. The class mean on the Algebra I Co-operative Test (E.T.S.) was in the eighty-fifth percentile.

20 per cent of the seventh grade students used sixth grade material for the first half year. In general, the format of the class was more traditional than the Mathematics Laboratory. This move was necessitated by two factors common to most of the youngsters: reading difficulties and lack of self-motivation. About 25 per cent of the eighth grade students used seventh grade material for the first half of the year. Again the learning vehicle was essentially traditional. However, self-tests, check-tests, and unit tests were used.

Objective 4

To determine whether students, each learning at his own level, will average as high on standardized tests as they average under normal classroom organization in the junior high school.

Because of the lack of knowledge concerning the variables that have a causative relationship to achievement, it is necessary to control for all possible variation other than the variable of experimental interest; in this case, the presence or absence of a self-study program.

There is only one way to control for unknown variation and that is randomization (Edwards, 1963, p. 70-71). If subjects are randomly assigned to treatments, then any difference between the groups which exceeds that which can be satisfactorily explained by random variation may be ascribed to the treatments with a known degree of confidence that this is true.

In this study the subjects were not randomly assigned to treatments and, therefore, no statistical test of significance is applicable. We could find out if the groups were significantly different, but we would have no information about why they were or were not different.

For these reasons a valid statistical analysis is limited to a description of the various groups. A table was constructed of the means for each class for each of the measures used (Table 2 ). Also a weighted average of the programmed and non-programmed years is presented (Table 3 ).

It was decided that the results should be discussed in terms of practical significance instead of statistical significance. Now in terms of practical significance we would prefer that method of instruction that is clearly superior. Given that either method is satisfactory - that no large difference exists - we would base our decision on which method to use on other considerations.

In Table 2 on the eighth grade criterion measures, attitude, STEP-Mathematics, and SCAT-Quantitative, the differences among the various classes are not large. There is no dramatic change produced by the self-study program. The class of 1970 does appear somewhat better on the eighth grade STEP-Mathematics, but they also appear better on the seventh grade STEP-Mathematics.

The absence of SCAT-Quantitative scores for two of the classes makes any attempt at interpretation of differences on this variable weak. However, differences approaching four points occur where supposedly no changes were made in the teaching method. We, therefore, conclude that Table 2 provides no basis for preferring one method of instruction over the other.

Table 3 makes any difference in the results from the two methods of instruction seem even less likely. The difference between the traditional groups and the class of 1970 on eighth grade STEP-Mathematics is 2+ points in favor of the experimental group. However, the experimental group was 2+ points higher than the traditional groups on the seventh grade STEP-Mathematics.

We conclude that, for these students in this self-study program, there is no reason to prefer one method over the other as judged by differences on the criterion measures used.

Objective 5

To find out what percentage of the junior high school student population cannot successfully employ self-study techniques as determined by passing scores on check-tests given after each unit of study.

Some students from both the seventh and eighth grades were not put in the Mathematics Laboratory in September. As previously noted, deficiencies in reading ability and motivation were factors considered in not allowing some to participate. Other students were removed at a later date for failure to pass check-tests.

In all, about 35 per cent of the class did not participate in or did not prosper under the Mathematics Laboratory process.

Objective 6

To be able to predict which students are unable to profit from self-study by correlating scores on I.Q., personality tests, and achievement tests with individuals who must be removed from self-study classes for inadequate performance.

What we are predicting is INS and OUTS; but also, the results of a process of selection. If the process of selection is not consistent then the results of the process are not predictable by an analysis of past results.

The chosen method of analysis was to establish a consistent objective process of selection ex post facto and to attempt to predict the result of this process. The method used was to attempt to discriminate between those students who fall above and below a certain score on one or more of the check tests.

The decision rule employed was that a student was to be labeled an OUT if he scored below 60 per cent on two or more check-tests in units three and four of the self-study program. A discriminant analysis was then done between INS and OUTS using the seventh grade mathematics STEP score and the Kulner A I.Q. score as test variables.

Most of the students were removed from this analysis. Some students did not have STEP scores or I.Q. scores. There were two kinds of I.Q. tests used and the Kulner A I.Q. test was chosen for this analysis. About one-half the sample had each kind of I.Q. test, but none had both. Some students completed very few check tests in units three or four and it was felt that there was insufficient basis on which to label them. Also, some students were never in the self-study program.

The remaining sample contained 59 classifiable students. Of these, 28 were classified as INS and 31 were classified as OUTS on the basis of the decision rule. The analysis was performed with programs of the Multivariate Statistical Analyser (Jones, 1964).

The value of Wilk's Lamda was .7953701. Rao' F approximation was used to test the significance of this value. F was found to equal 7.2037 with 2 and 56 degrees of freedom. This value of F is significant at well beyond the .01 level.

Therefore, we arrive at the conclusion that INS and OUTS as defined by the decision rule can be significantly differentiated by seventh grade STEP mathematics scores and Kulner A I.Q. test scores.

The classification table (Table 4) shows the number correctly and incorrectly classified by the discriminant function derived from the analysis. The hits and misses table (Table 5) shows that 69.49 per cent of the members of this sample were correctly classified by this procedure.

The INS are characterized by having higher STEP scores. The mean for INS was 273.18 as compared with 266.29 for OUTS. The INS are further characterized by having higher Kulner A I.Q. test scores. The mean for INS was 127.07 as compared with 114.97 for OUTS. Both of these variables significantly differentiated between INS and OUTS. The F for STEP was 11.56 and the F for Kulner I.Q. was 9.94, each with 1 and 57 degrees of freedom. Both values of F are significant at beyond the .01 level.

Since the purpose of this objective was to determine if classification of INS and OUTS may be accurately made from measures taken prior to entry in a self-study program, there is no particular point to reporting the discriminant function found for this sample. We can say that there is evidence that such classification is possible for these students, in this self-study program, where the decision rule is as stated above.

The brighter students with a better level of achievement in mathematics are more able to participate in a self-study program than students with either low I.Q. scores or low mathematics achievement scores. The INS and OUTS are consistently different on every variable (Tables 7 and 8). The INS for each class received higher scores on measures taken both before and after treatment. The actual composition of INS and OUTS is consistent with that found using the objective decision rule.

Objective 7

To determine what staff and what levels of professionalism are necessary for maintaining speed and quality of mastery through self-instruction comparable to those gained through traditional instruction.

To determine the minimum staff requirements necessary to maintain a successful self-study program requires first that the self-study program be successful at some level of staffing and then to systematically reduce the level of staffing until the self-study program fails to operate properly. The minimum level is then that level just higher than the last level tried. In the time available, following through with this scheme was impossible.

Objective 8

To determine what change in student attitude, if any, toward mathematics is caused by the self-instruction method of learning.

A Mathematics Attitude test (taken from M. De Veault) was administered before, during and after the study. Scores on this attitude test ranged from zero to ten. A score of 5 is considered to be neutral.

It seems clear from Table 6 that the self-study program has not altered to any great extent the students' attitude toward mathematics as indicated by scores on the mathematics attitude test. In fact, the class of 1970 dropped more over the 7th grade period than did the class of 1969. The difference however, is so slight (.07) that even the direction of the difference is questionable. We conclude that the self-study program had a minimal effect on student attitude toward mathematics.

Since mathematics attitude scores are not available for the traditional groups we can say nothing one way or the other about the self-study program as opposed to the traditional method with regard to mathematics attitude. The observed behavior of INS and OUTS (Table 8) on the mathematics attitude test were not consistent from one year to the other. While changes in the self-study program could be the reason for difference for INS, no explanation is apparent for the OUTS.

RELATED RESEARCH

In order to obtain more information to support the validity of the check-tests and unit tests being used as evaluation instruments, two neighboring communities of a similar socio-economic texture to that of Weston were selected to use these tests. Both the towns of Wellesley and Sudbury, who were using the SMSG textbook with the more capable pupils in their Junior High Schools, agreed to administer the tests to some of their classes.

In Wellesley, by random selection, several tests were given to the average and above-average seventh and eighth grade classes. In Sudbury, the upper third of the seventh and eighth grades participated in the testing program. Comparable ability groups were chosen in Weston. All teachers in Wellesley and Sudbury did not wish to participate. Those that did were given freedom in selecting specific sections of the SMSG content on which they would test. Consequently, little uniformity could be obtained in the testing pattern other than between Weston and Wellesley, or between Weston and Sudbury.

Graphs were made for each of the tests taken and a comparison made of the similar groups representing the three schools. Approximately 15 per cent of the top pupils in the eighth grade of Weston were taking Algebra, and therefore, were not involved in this study.

A marked similarity of the grades as regard to range and distribution was noted. In almost all cases the skewing was proportional and the medians the same. Test scores were skewed toward the upper end with the superior students, while a more symmetrical distribution was obtained from the average and lower pupils.

The results of this survey indicate that Weston tests could be used for evaluative purposes at either of the three schools despite the difference in the teaching and learning process. The tests appear to measure mastery of concept and content equally well at each of the three schools. Variations in test scores may be accounted for in part by different grouping policies within each of the school systems. Weston pupils appear to learn as effectively those areas of mathematics measured by the tests as do the pupils of Wellesley and Sudbury under their more traditional methods of instruction. (Table 1 )

The results of this survey suggest the possibility for further research on a cooperative basis between schools. Establis' 'ng of local inter-school norms could lead to more effective evaluative instruments, improvement of teaching technique, more rapid evolution and updating of curriculum, and a greater variation in learning and teaching processes. Computerized individual evaluative techniques could provide valuable service as another instructional aid to teachers using the Mathematics Laboratory method.

## SUMMARY OF THE RESULTS

1. It is possible to predict about 70 per cent of INS and OUTS on a first sample.

2. The differences in achievement among traditional classes and self-study classes were not large enough to provide a basis for preferring one method of instruction to the other.

3. The self-study program did not appear to affect student attitude toward mathematics.

4. The testing program seems to be valid and holds promise for extension to a variety of techniques.

TABLE 1

MEDIANS FOR CHECK TESTS USED IN SURVEY

| 7th grade | Weston | Sudbury |
|---|---|---|
| 4-6 | 80 | 80 |
| 4-7 | 80 | 80 |
| 5-1 | 90 | 80 |
| 5-2 | 90 | 90 |
| 5-3 | 90 | 90 |
| **8th grade** | | |
| 2-3 | 90 | 90 |
| 3-1 | 80 | 80 |
| 3-2 | 80 | 80 |

| 7th grade | Weston | Wellesley |
|---|---|---|
| 3-5 | 80 | 70 |
| 4-2 | 80 | 80 |
| 4-3 | 80 | 60 |
| **8th grade** | | |
| 2-2a | 80 | 50 |
| 2-2c | 80-90 | 80 |
| 2-3 | 80 | 70 |
| 4-3, 4-4 | 90 | 90 |

MEDIANS FOR UNIT TESTS USED IN SURVEY

| | | High Groups | | |
|---|---|---|---|---|
| | | Weston | Wellesley | Sudbury |
| Grade 8 | Test 1 | 92 | 97 | -- |
| Grade 7 | Test 3 | 77 | 82 | 87 |
| Grade 7 | Test 4 | 82 | -- | 82 |

| | | High-Average Groups | |
|---|---|---|---|
| | | Weston | Wellesley |
| Grade 8 | Test 1 | 77 | 77 |
| Grade 7 | Test 2 | 87 | 82 |
| Grade 7 | Test 4 | 72 | 67 |

TABLE 2

THE MEANS AND STANDARD DEVIATIONS OF SELF-STUDY AND TRADITIONAL GROUPS ON ALL MEASURES

| Test | | Year of Graduation | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1965 | 1966 | 1967 | 1968* | 1969* | 1970* |
| Calif. I.Q. | Mean | 117.16 | 119.47 | 120.17 | 118.69 | 123.06 | 121.47 |
| | S.D. | 16.44 | 16.80 | 15.52 | 14.34 | 12.77 | 12.96 |
| | No. | 83 | 106 | 99 | 94 | 108 | 80 |
| Kulner A I.Q. | Mean | -- | -- | -- | -- | -- | 116.30 |
| | S.D. | -- | -- | -- | -- | -- | 17.32 |
| | No. | -- | -- | -- | -- | -- | 90 |
| 6th Grade** Attitude | Mean | -- | -- | -- | -- | 6.59 | 6.83 |
| | S.D. | -- | -- | -- | -- | -- | -- |
| | No. | -- | -- | -- | -- | 911 | 1049 |
| 7th Grade STEP | Mean | 264.80 | 266.93 | 264.00 | 267.62 | 266.67 | 267.76 |
| | S.D. | 13.09 | 12.19 | 12.59 | 11.70 | 12.48 | 9.88 |
| | No. | 89 | 124 | 117 | 127 | 178 | 193 |
| 7th Grade SCAT-Q | Mean | 275.78 | 279.47 | 279.36 | 275.76 | 275.62 | -- |
| | S.D. | 12.30 | 14.41 | 12.41 | 11.99 | 12.94 | -- |
| | No. | 91 | 127 | 118 | 126 | 178 | -- |
| 8th Grade** Attitude | Mean | -- | -- | -- | -- | 6.23 | 6.40 |
| | S.D. | -- | -- | -- | -- | -- | -- |
| | No. | -- | -- | -- | -- | 1373 | 175 |
| 8th Grade STEP | Mean | 271.83 | 271.99 | 271.24 | 270.70 | 271.62 | 273.99 |
| | S.D. | 12.38 | 12.58 | 10.56 | 11.54 | 12.44 | 12.25 |
| | No. | 94 | 131 | 131 | 141 | 167 | 169 |
| 8th Grade SCAT-Q | Mean | 288.64 | 288.12 | 286.29 | 282.72 | -- | 285.78 |
| | S.D. | 14.08 | 16.34 | 13.43 | 14.27 | -- | 14.94 |
| | No. | 96 | 129 | 129 | 141 | -- | 174 |

* Years of the self-study program
** All statistics are computed per response.

TABLE 3

THE MEANS AND STANDARD DEVIATIONS ON ALL MEASURES FOR POOLED GROUPS--TRADITIONAL, SELF-STUDY (PRE-EXPERIMENTAL YEAR), AND SELF-STUDY (EXPERIMENTAL YEAR)

| Test | | Group | | |
|---|---|---|---|---|
| | | Traditional* | Self-Study (1)* | Self-Study (2) |
| Calif. I.Q. | Mean | 119.04 | 121.03 | 121.47 |
| | S.D. | 16.29 | 13.47 | 12.96 |
| | No. | 288 | 202 | 80 |
| Kulner A I.Q. | Mean | -- | -- | 116.30 |
| | S.D. | -- | -- | 17.32 |
| | No. | -- | -- | 90 |
| 6th Grade Attitude | Mean** | -- | 6.59 | 6.83 |
| | S.D. | -- | -- | -- |
| | No. | -- | 911 | 1049 |
| 7th Grade STEP | Mean | 265.32 | 267.90 | 267.76 |
| | S.D. | 12.54 | 12.22 | 9.88 |
| | No. | 330 | 305 | 193 |
| 7th Grade SCAT | Mean | 278.43 | 275.68 | -- |
| | S.D. | 13.27 | 12.63 | -- |
| | No. | 336 | 304 | -- |
| 8th Grade Attitude | Mean | -- | 6.23 | 6.40 |
| | S.D. | -- | -- | -- |
| | No. | -- | 1373 | 175 |
| 8th Grade STEP | Mean** | 271.67 | 271.20 | 273.99 |
| | S.D. | 11.77 | 12.37 | 12.25 |
| | No. | 356 | 308 | 169 |
| 8th Grade SCAT | Mean | 287.60 | 282.72 | 285.78 |
| | S.D. | 14.78 | 14.27 | 14.94 |
| | No. | 355 | 141 | 174 |

(1) Pre-experimental years (2) Experimental year

* Weighted mean standard deviations.

** All statistics are computed per response.

TABLE 4

A COMPARISON OF A CLASSIFICATION OF INS AND OUTS
BASED ON A DISCRIMINATE FUNCTION AND
THE OBSERVED CLASSIFICATION

| Observed Classification | Discriminate Classification | |
|---|---|---|
| | IN | OUT |
| IN | 16 | 12 |
| OUT | 6 | 25 |

TABLE 5

HITS AND MISSES BASED ON A DISCRIMINANT
FUNCTION BETWEEN INS AND OUTS

| HITS | MISSES |
|---|---|
| 41 | 18 |

TABLE 6

THE DIFFERENCE BETWEEN THE MEANS ON TWO ADMINISTRATIONS
OF A MATHEMATICS ATTITUDE TEST FOR TRADITIONAL
AND SELF-STUDY GROUPS

| 1969* | 1970* |
|---|---|
| -.36 | -.43 |

* Years of the self-study program.

TABLE 7

THE MEANS AND STANDARD DEVIATIONS OF THE POOLED TRADITIONAL GROUP AND SELF-STUDY GROUPS DIVIDED INTO THOSE WHO STAYED IN THE SELF-STUDY PROGRAM (IN) AND THOSE WHO WERE REMOVED FROM THE SELF-STUDY PROGRAM (OUT) ON ALL MEASURES

| Test | | Group | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Pooled Traditional | 1968 | | 1969 | | 1970 | |
| | | | In | Out | In | Out | In | Out |
| Calif. I.Q. | Mean | 119.04 | 116.69 | | 124.97 | 117.86 | 122.30 | 119.00 |
| | S.D. | 16.29 | 14.34 | | 12.31 | 12.98 | 13.55 | 11.27 |
| | No. | 288 | 94 | | 79 | 29 | 60 | 20 |
| Kulner A I.Q. | Mean | -- | -- | | -- | -- | 121.33 | 104.56 |
| | S.D. | -- | -- | | -- | -- | 16.13 | 14.41 |
| | No. | -- | -- | | -- | -- | 63 | 27 |
| 6th Grade** Attitude | Mean | -- | -- | | 6.72 | 6.40 | 7.13 | 6.51 |
| | S.D. | -- | -- | | -- | -- | -- | -- |
| | No. | -- | -- | | 527 | 384 | 541 | 508 |
| 7th Grade STEP | Mean | 265.32 | 267.62 | | 269.29 | 258.91 | 270.44 | 262.02 |
| | S.D. | 12.54- | 11.70 | | 10.54 | 14.65 | 8.78 | 9.51 |
| | No. | 330 | 127 | | 133 | 45 | 133 | 55 |
| 7th Grade SCAT | Mean | 278.43 | 275.76 | | 277.26 | 270.78 | -- | -- |
| | S.D. | 13.27 | 11.99 | | 12.87 | 12.15 | -- | -- |
| | No. | 336 | 126 | | 133 | 45 | -- | -- |
| 8th Grade** Attitude | Mean | -- | -- | | 6.76 | 5.60 | 6.41 | 6.38 |
| | S.D. | -- | -- | | -- | -- | -- | -- |
| | No. | -- | -- | | 757 | 616 | 133 | 42 |
| 8th Grade STEP | Mean | 271.67 | 270.70 | | 274.57 | 265.24 | 277.33 | 265.30 |
| | S.D. | 11.77 | 11.54 | | 10.01 | 11.07 | 10.97 | 11.72 |
| | No. | 356 | 141 | | 118 | 46 | 118 | 44 |
| 8th Grade SCAT | Mean | 287.60 | 282.72 | | -- | -- | 289.36 | 276.00 |
| | S.D. | 14.78 | 14.27 | | -- | -- | 14.04 | 12.42 |
| | No. | 355 | 141 | | -- | -- | 121 | 45 |

** All statistics are computed per response.

TABLE 8

THE MEANS AND STANDARD DEVIATIONS OF POOLED TRADITIONAL, SELF-STUDY PRE-EXPERIMENTAL YEAR, AND SELF-STUDY EXPERIMENTAL YEAR GROUPS WITH SELF-STUDY GROUPS DIVIDED INTO THOSE WHO STAYED IN THE SELF-STUDY PROGRAM (IN) AND THOSE WHO WERE REMOVED FROM THE SELF-STUDY PROGRAM (OUT) ON ALL MEASURES

| Test | | Group | | | | |
|---|---|---|---|---|---|---|
| | | Traditional | Self-Study (1) | | Self-Study (2) | |
| | | | In | Out | In | Out |
| Calif. | Mean | 119.04 | 120.47 | 117.86 | 122.30 | 119.00 |
| I.Q. | S.D. | 16.29 | 13.54 | 12.98 | 13.55 | 11.27 |
| | No. | 288 | 173 | 29 | 60 | 20 |
| Kulner A | Mean | -- | -- | -- | 121.33 | 104.56 |
| I.Q. | S.D. | -- | -- | -- | 16.13 | 14.41 |
| | No. | -- | -- | -- | 63 | 27 |
| 6th Grade | Mean** | -- | 6.72 | 6.40 | 7.13 | 6.51 |
| Attitude | S.D. | -- | -- | -- | -- | -- |
| | No. | -- | 527 | 384 | 541 | 508 |
| 7th Grade | Mean | 265.32 | 268.47 | 258.91 | 270.44 | 262.02 |
| STEP | S.D. | 12.54 | 11.11 | 14.65 | 8.78 | 9.51 |
| | No. | 330 | 260 | 45 | 133 | 55 |
| 7th Grade | Mean | 278.43 | 276.53 | 270.78 | -- | -- |
| SCAT | S.D. | 13.27 | 12.45 | 12.15 | -- | -- |
| | No. | 336 | 259 | 45 | -- | -- |
| 8th Grade | Mean** | -- | 6.74 | 5.60 | 6.41 | 6.38 |
| Attitude | S.D. | -- | -- | -- | -- | -- |
| | No. | -- | 757 | 616 | 133 | 42 |
| 8th Grade | Mean | 271.67 | 272.46 | 265.24 | 277.33 | 265.30 |
| STEP | S.D. | 11.77 | 10.44 | 11.07 | 10.97 | 11.72 |
| | No. | 356 | 259 | 46 | 118 | 44 |
| 8th Grade | Mean | 287.60 | 282.72 | -- | 289.36 | 276.00 |
| SCAT | S.D. | 14.78 | 14.27 | -- | 14.04 | 12.42 |
| | No. | 355 | 141 | -- | 121 | 45 |

(1) Pre-experimental year (2) Experimental year

** All statistics computed per response.